

Having thus described the preferred embodiment, the invention is now claimed to be:

1. An image guided surgery system comprising:
a low cost integrated computer;
software-integrated disposable kits including:
a digital medium with application-specific software; and,
5 instrumented disposable surgical tools;
a tracking system which locates the surgical tools while in use; and
10 a display used in conjunction with the computer.
2. The image guided surgery system as set forth in claim 1 wherein the low cost integrated computer includes:
5 a portion of image guided surgery software that provides minimal user functionality, full user functionality being enabled by the application specific software obtained from the digital medium of the software-integrated disposable kit.
3. The image guided surgery system as set forth in claim 1 further including:
a low cost mobile cart that holds at least the computer, display, and standard peripherals.
4. The image guided surgery system as set forth in claim 1 wherein the computer includes:
a drive which receives and reads the digital medium.

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5. The image guided surgery system as set forth in claim 1 further including:

5 a means for deactivating or encrypting the digital medium against reuse at the end of a surgical procedure.

6. The image guided surgery system as set forth in claim 1 wherein the computer includes:

5 an input/output interface for capturing still-images and/or live video from an imaging device;

5 a graphic input/output interface for connecting to the display;

an interface for interconnection with at least one of a wired user input device and a wireless user input; and,

10 an interface for interconnection with tracking sensors for monitoring position and movement of the instrumented surgical tools.

7. The image guided surgery system as set forth in claim 1 wherein the software-integrated disposable kit further includes:

5 a label to identify a particular surgical procedure to be performed using the kit;

sterile packaging in which the instrumented disposable surgical tools are contained in sterile condition;

10 other accessories in sterile condition in sterile packaging;

user input devices; and

wherein the digital medium is a disposable one-time use digital medium readable by the computer and contains a portion of image guided surgery software specific to the particular surgical procedure.

8. The image guided surgery system as set forth in claim 9 wherein the user input devices include:
a disposable, sterilizable, wireless peripheral for use by a surgeon at the surgical site for remote communication with the computer.

9. The image guided surgery system as set forth in claim 1 wherein the digital medium includes:
a preprogrammed one-time-use application specific software module to be used in surgery; and
a preprogrammed software module describing the surgical tools, implants, and other accessories.

10. The image guided surgery system as set forth in claim 1 wherein the digital medium includes:
preprogrammed software describing dimensional specifications of each of the tools, probes, guides, and any other instrumented accessories contained in the kit.

11. The image guided surgery system as set forth in claim 1 wherein the digital medium includes:
preprogrammed software with 3D virtual representations, images, or information of instrumented tools, accessories, implants, and any associated hardware contained in the kits used to create 3D virtual representations of the surgical tools in the images on the display.

12. The image guided surgery system as set forth in claim 1, the digital medium includes:
preprogrammed software for superimposing instrumented tools, accessories, implants, and associated hardware on the images in a wireframe or a user selected custom format.

13. The image guided surgery system as set forth in claim 1 wherein the digital medium includes:

an area which stores the software application which enables full user functionality;

5 an area which stores specifications and characteristics of the instrumented surgical tools;

an area which stores 3D virtual representations, images, or information of the instrumented tools and accessories contained in the kit; and

10 an area which stores additional information relevant to a particular surgical procedure.

14. The image guided surgery system as set forth in claim 1 wherein the tracking system includes:

one of acoustic sensors, infrared sensors, video cameras, that are utilized to determine a location of the 5 instrumented surgical tools.

15. The image guided surgery system as set forth in claim 1 wherein the tracking system includes:

a mobile cart for positioning the camera in the surgical suite.

16. A method of image guided surgery using a computer, a one-time-use surgical application specific kit that contains a digital medium with application specific software and instrumented surgical tools and accessories,

5 a tracking system that locates the instrumented surgical tools while in use, and a display, the method comprising:

at a surgical site, removing the digital medium from the kit and inserting it into the computer;

10 augmenting software on the computer with software from the digital medium to process diagnostic images, register the diagnostic images to a patient's anatomy, register different sets of imaging modalities to each other, and track locations of the instrumented surgical tool;

Sub b 17. The method as set forth in claim 16 further including:

using the computer as a planning station before a surgical procedure to define surgical entry points and 5 trajectories.

18. The method as set forth in claim 16 further includes:

5 archiving on the digital medium a record or history of the performed surgical procedure, including the downloaded diagnostic images, selected instruments, implants, length of surgical time, notes, or other relevant information obtained during the surgical procedure.

19. The method as set forth in claim 18 further includes:

replaying archived data for review and diagnostic follow-up.

20. The method as set forth in claim 16 further including:

deactivating or encrypting the digital medium against reuse after the surgical procedure.

21. The method as set forth in claim 16 further including: *✓*

preventing reuse of the disposable surgical tools.

22. The method as set forth in claim 16 further including:

disposing of the surgical instruments and the digital medium without reuse after the surgical procedure.

23. A method of image guided surgery comprising:

5 providing a kit which includes (1) surgical tools and accessories and (2) a digital medium which is preprogrammed with (i) at least a portion of a graphics processing program and (ii) information concerning the surgical tools and accessories;

10 at a surgical site, removing the secure digital medium from the kit and inserting it into a processor which, between software with which the processor is preprogrammed and the software from the digital medium, processes electronic medical diagnostic images, correlates a coordinate system of a patient with a coordinate system of the diagnostic images, tracks a location of the 15 instrumented surgical tools in the coordinate system of the patient, and translates the instrument position into the coordinate system of the diagnostic image.

24. The method as set forth in claim 23 wherein the surgical kit further includes:

medical appliances, and

5 a user control for interconnection with the processor to control image displays.

25. The method as set forth in claim 24 further including:

5 prior to placing the surgical tools, the surgical appliances, and the user control in the surgical kit, packaging the surgical tools, the surgical appliances, and user control in sterile condition in sterile packaging.

26. The method as set forth in claim 24 further including:

5 prior to placing the digital medium in the kit, programming the medium, with information about the surgical tools and the medical appliances in the kit.

27. The method as set forth in claim 23 further including:

5 prior to placing the digital medium in the kit, programming the digital medium with dimensional information about and depictions of the surgical tools.

28. The method as set forth in claim 23 further including:

after the surgical procedure, deactivating the digital media against reuse.

29. The method as set forth in claim 28 further including:

5 after the surgical procedure, disposing the surgical instruments and the secure digital media without reuse.

Sub B2 30. A surgical kit comprising:
an identification of a surgical procedure to be performed using the kit;
5 instrumented surgical tools in sterile condition in sterile packaging which are used in the identified surgical procedure;
medical appliances in sterile condition in sterile packaging which are used in the identified surgical procedure;
10 an operator control in sterile condition in sterile packaging for electrical interconnection with a graphics processor outside a sterile field; and,

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15 a digital media preprogrammed with a portion of an image guided surgery processing program and descriptive information concerning the tools and the appliances in the kit which is readable by the processor.

31. An image guided surgery system comprising:
a set of surgical tools which are instrumented to be tracked during image guided surgery;
a processor which is preprogrammed with less
5 than all of the software which is used for manipulating diagnostic images during the image guided surgery and for tracking the movement of the instrumented surgical tools during the image guided surgery;
a digital media which is preprogrammed with a
10 remaining portion of the software for processing the diagnostic image data and tracking movement of the instrumented surgical tools and with descriptive information concerning the instrumented surgical tools.

32. The system as set forth in claim 31 wherein the processor includes:

a reader which receives and reads the digital media.

33. The system as set forth in claim 32 wherein the processor further includes:

a deactivator which deactivates the digital media against reuse at the end of an image guided surgical procedure.
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34. The system as set forth in claim 32 further including a surgical kit which includes:

an indication of a surgical procedure with which the kit is to be utilized;

5 the instrumented surgical tools for use in the indicated surgical procedure; and,
the digital media.

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35. The system as set forth in claim 34 wherein the kit further includes:

surgical appliances used in the indicated procedure; and

5 a user input control for controlling the processor, the user input control, the surgical appliances, and the surgical tools all being in sterile condition in the kit.

36. The system as set forth in claim 31 wherein the processor includes:

an interface for interconnection with a source of three-dimensional electronic diagnostic images;

5 an interface for interconnection with a human-readable display for displaying diagnostic images and superimposed representations of the surgical tools;

an interface for interconnection with a user input control; and,

10 an interface for interconnection with optical sensors for monitoring position and movement of the instrumented surgical tools.

37. The system as set forth in claim 31 wherein the digital media includes:

a first memory portion which stores the remain software portion;

5 a second memory portion which stores descriptive characteristics of the instrumented surgical tools;

a third memory section which stores shape displays corresponding to the surgical tools for display superimposed on a display of the diagnostic image; and,

10 a fourth memory portion which carries additional information.

5 Web3 38. In an image guided surgery system having a tracking system for tracking movement of surgical tools,

5 a human-viewable display, and a computer with limited user functionality for retrieving surgical information, displaying and manipulating diagnostic images on the display, surgical planning, and superimposing representations of the surgical tools on the images on the display, the improvement comprising:

10 a single use digital medium containing software to upgrade the computer temporarily to full user functionality for a preselected surgical procedure; and, a means for disabling the software from being reused to upgrade the computer after the preselected surgical procedure.

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